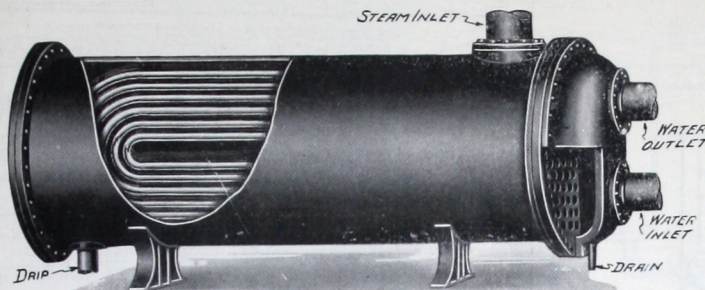


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## WHITLOCK TYPE "R" INSTANTANEOUS HEATERS



Type "R"  
Instantaneous  
Heaters

Fig. 1. Type R Instantaneous Heater

Whitlock Type "R" Instantaneous Heaters are favored by a large and ever increasing number of Architects and Engineers because of their compactness, their simplicity of construction, and because they are peculiarly adapted to several important classes of service. The following description of the details of their construction clearly shows the reason for this favor.

### DETAILS OF CONSTRUCTION

#### Heating Section

The heating section is made up of U-bends of heavy gauge seamless drawn copper tubing, both ends of which are expanded into a heavy rolled steel tube sheet.

This design makes a particularly compact tube bundle which can be readily removed from the shell if necessary. With the U-tube construction, the heating section is fixed to the shell at one end only so that any amount of expansion and contraction of the shell or heating section, is automatically taken care of independently of any other part.

#### Shell

For low steam pressures, on the smaller size heaters, the shells are made of the best commercial grade of cast iron. Larger sizes are furnished with riveted or welded steel shells, with joints properly designed for the working pressures to which they are to be subjected. When the heaters are to be subjected to high steam pressures the shells are made of steel pipe with Van Stone end flanges.

Connections up to and including  $2\frac{1}{2}$ " diameter are properly bossed and tapped to the shell directly. Larger size connections are made to saddleports, cast integral with the shell, faced and drilled for A. S. M. E. flanges. For steel shells saddleports are either riveted or welded to the shell.

A baffle plate, located in the steam inlet, serves both to distribute the steam over the entire heating section and to protect the tubes from the erosion caused by the direct impact of the steam.

#### Heads

Both front and rear heads are ordinarily furnished of heavy cast iron but for high pressure work heads of cast steel can be furnished.

The front head, or water distributing chamber, is ribbed to direct the water through the proper number of tubes. These ribs are designed to conform to the tube arrangement making the heater a two, four or multipass heater as conditions of service require. (See Explanation on Page 5)

#### Test

Every Whitlock Type "R" Heater is submitted to a hydrostatic test pressure of 50% in excess of the working pressure specified. Both heater shell and heating section must be absolutely tight under this test in order to receive the Whitlock Certificate of Inspection which is our guarantee that the heater, as shipped, is entirely free from leaks. This certificate is forwarded to the customer with the shipping papers.

### USES FOR INSTANTANEOUS HEATERS

Mention has already been made of the fact that certain features of the design of these heaters make them well fitted for many important classes of service.

The instantaneous heater is primarily designed for conditions demanding a constant, or nearly constant, supply of water at a given temperature. This ideal condition is rarely, if ever, attained. It is, however, a well established practice to use this type of heater for various services where this condition is approximated.

Complete descriptions of the more common uses for the instantaneous heater are given on the following pages.

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# Capacities and Roughing-In Dimensions for Whitlock Type "R" Instantaneous Heaters

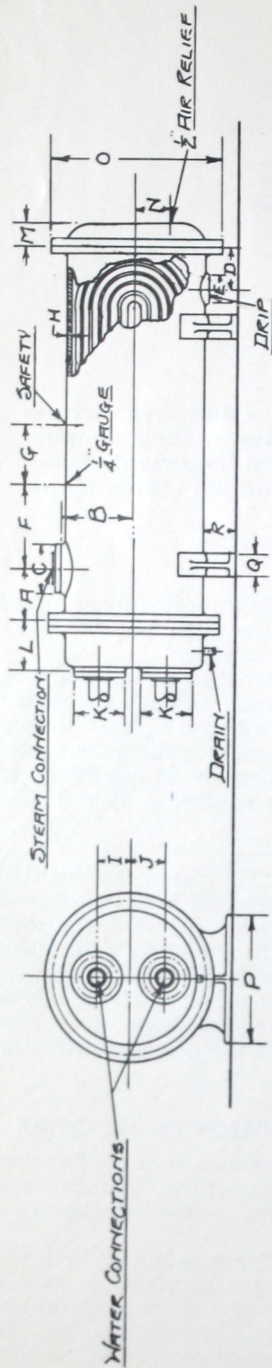


Fig. 2

TABLE 1—TWO-PASS  
Temperature range 40° F to 80° F based on using steam at 0 lb. gage

Heater No.	Velocity In Ft. Per Min.	Capacity Gallons Per Hour	Length Overall	Weight 80"	SHELL										WATER DISTRIBUTING CHAMBER										HEAD REAR			CRADLES		
					Diam.	Length	Matel.	Steam Inlet	Drip	A	B	C	D	E	F	G	H	Diam.	Water Conns.	Drain	I	J	K	L	M	N	O	P	Q	R
0	16	150	1134	80*	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
1	37	350	1454	90	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
2	68	650	1954	110	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
3	117	1100	2354	130	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
4	170	1600	2854	145	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
5	202	1900	3454	170	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
6	135	2550	2454	240	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
7	170	3200	3054	270	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
8	272	5800	4354	300	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
9	272	5800	4354	300	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
10	338	6350	5554	420	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
11	188	7950	5554	610	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
12	226	9550	5554	670	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
13	300	12,700	6754	810	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
14	218	15,900	5154	930	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
15	267	19,100	5954	1040	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
16	252	25,000	5954	1320	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
17	325	31,700	7154	1510	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
18	364	38,200	6154	1940	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
19	357	40,400	7054	2100	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
20	357	57,100	5954	2800	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
21	317	63,450	6454	3020	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
22	266	79,300	7654	3500	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
23	354	126,900	8354	4780	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
24	290	158,400	7854	6550	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
25	351	191,000	8954	7060	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

All dimensions are in inches.  
 Sizes 0 to 10 have 3/4" O. D. No. 18 B. W. G. Copper tube.  
 Larger sizes have 1" O. D. No. 17 B. W. G. Copper tubes  
 (Continued on pages 4 and 5)



## Instantaneous Heaters with Storage Tanks

This arrangement is to be desired when hot water demand fluctuates greatly. Continual heating stores water for the peak load while allowing a more uniform load on the boiler.

If the heater is to operate in connection with a storage tank by gravity circulation we should be advised before the order is placed. The reason for this is that the low velocity, of 50 to 60 feet per minute, which may be expected with this type of installation, demands properly proportioned connections and interconnecting pipe lines.

To estimate the size heater required for this service, heating water to 180°F. with atmospheric steam, figure on a two pass heater having a capacity of 50% of the listed rating of a multipass heater as shown in Table 1.

For forced circulation with a pump, the proper heater size may be read directly from the tables for the temperature ranges shown.

Before deciding to install a storage tank with an independent heater connected to it we strongly recommend a careful consideration of our Whitlock Type "K" Storage Heater as shown in Bulletin 40.

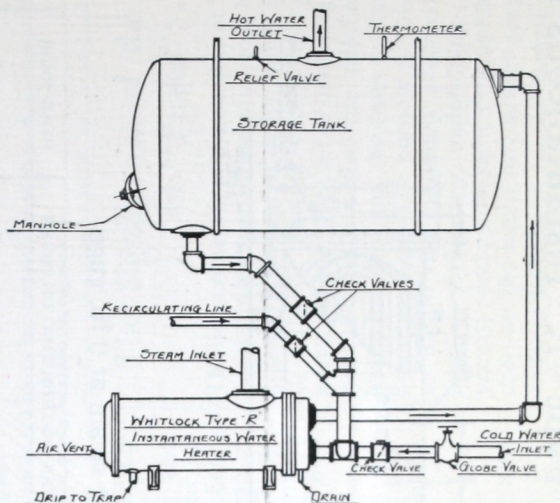


Fig. 3

Type "R" Heater as Auxiliary with Storage Tank—Gravity Circulation.

## Swimming Pool Heaters

The water is heated as it goes to the pool for the first time or as it is re-circulated through filters and purifiers to the pool again. Best practice calls for a heater capable of heating the entire contents of the pool from 40° to 80° F. in from ten to twelve hours.

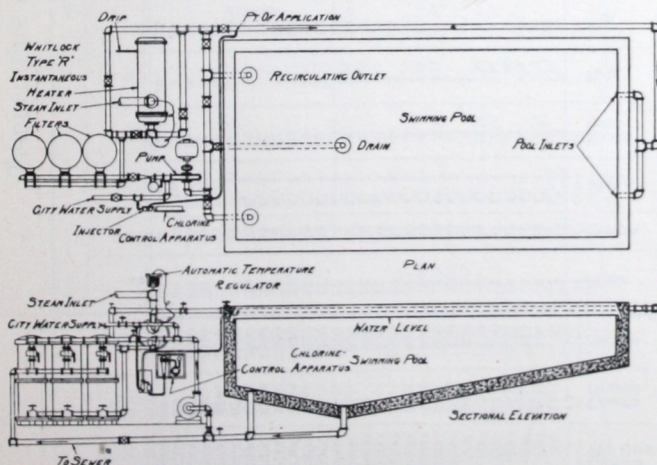


FIG. 4

Arrangement of Type "R" Swimming Pool Heater with Filters, Pumps, etc.

TABLE 2  
CAPACITIES OF WHITLOCK TYPE "R" 2 PASS SWIMMING POOL HEATERS

GALS. PER HOUR. WATER HEATED FROM 40°-80° F.

Steam Press	0#				2#				5#				Maximum Water	Maximum Steam
	Heater Number	Gals. Per Hour	Water Conn.	Steam Conn.	Heater Number	Gals. Per Hour	Water Conn.	Steam Conn.	Heater Number	Gals. Per Hour	Water Conn.	Steam Conn.		
	0	150	3/4"	1 1/4"	1	187	3/4"	1 1/4"	2	238	1"	1 1/4"	2	3
	1	350	1 1/4"	1 1/2"	2	400	1 1/4"	1 1/2"	3	455	1 1/4"	1 1/2"	3	3
	2	650	1 1/2"	1 3/4"	3	750	1 1/2"	1 3/4"	4	800	1 1/2"	1 3/4"	4	3
	3	1100	2"	2"	4	1300	2"	2"	5	1390	2"	2"	5	3
	4	1600	2 1/2"	2 1/2"	5	1690	2 1/2"	2 1/2"	6	1800	2 1/2"	2 1/2"	6	3
	5	1900	3"	3"	6	2160	3"	3"	7	2300	3"	3"	7	3
	6	2550	3 1/2"	3 1/2"	7	2880	3 1/2"	3 1/2"	8	3080	3 1/2"	3 1/2"	8	4 1/2
	7	3200	4"	4"	8	3370	4"	4"	9	3590	4"	4"	9	4 1/2
	8	3800	4 1/2"	4 1/2"	9	4340	4 1/2"	4 1/2"	10	4630	4 1/2"	4 1/2"	10	4 1/2
	9	5100	5"	5"	10	5780	5"	5"	11	6170	5"	5"	11	4 1/2
	10	6350	5 1/2"	5 1/2"	11	7230	5 1/2"	5 1/2"	12	9650	6"	6"	12	4 1/2
	11	7950	6"	6"	12	9050	6"	6"	13	11250	6 1/2"	6 1/2"	13	4 1/2
	12	9550	6 1/2"	6 1/2"	13	10550	6 1/2"	6 1/2"	14	14900	7"	7"	14	4 1/2
	13	12700	7"	7"	14	14000	7"	7"	15	18100	8"	8"	15	5
	14	15900	8"	8"	15	17000	8"	8"	16	22200	8 1/2"	8 1/2"	16	5 1/2
	15	19100	8 1/2"	8 1/2"	16	20800	8 1/2"	8 1/2"	17	30500	10"	10"	17	6
	16	25600	10"	10"		28600	10"	10"						10
	17	31700	10 1/2"	10 1/2"		36100	10 1/2"	10 1/2"						10

FOR COMPLETE TABLES WRITE FOR SHEET D59A



# Capacities and Roughing-In Dimensions for Whitlock Type "R" Instantaneous Heaters

(Continued from page 2)

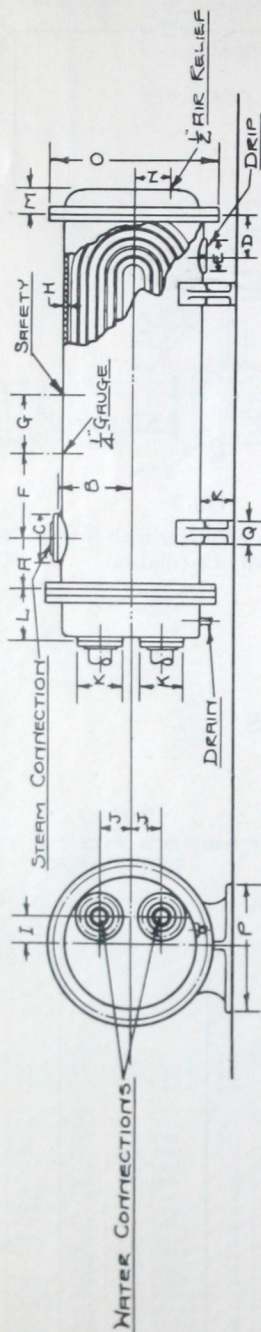


FIG. 5

TABLE 3 — FOUR-PASS

Temperature range 40° F to 120° F based on using steam at 0 lb. gage

Heater No.	Velocity In Ft. Per Min.	Capacity Gallons Per Hour	Length Overall	Weight	SHELL										WATER DISTRIBUTING CHAMBER						HEAD REAR		CRADLES				
					Diam.	Length	Mater.	Steam Inlet	Drp	A	B	C	D	E	F	G	H	Diam.	Water Conns.	Drain	I	J	K	L	M	N	O
0	17	80	1114	80	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
1	20	92	1274	100	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
2	23	104	1434	113	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
3	26	116	1594	126	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
4	29	128	1754	139	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
5	32	140	1914	152	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
6	35	152	2074	165	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
7	38	164	2234	178	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
8	41	176	2394	191	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
9	44	188	2554	204	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
10	47	200	2714	217	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
11	50	212	2874	230	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
12	53	224	3034	243	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
13	56	236	3194	256	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
14	59	248	3354	269	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
15	62	260	3514	282	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
16	65	272	3674	295	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
17	68	284	3834	308	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
18	71	296	3994	321	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
19	74	308	4154	334	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
20	77	320	4314	347	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
21	80	332	4474	360	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
22	83	344	4634	373	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
23	86	356	4794	386	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
24	89	368	4954	399	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
25	92	380	5114	412	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
26	95	392	5274	425	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
27	98	404	5434	438	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
28	101	416	5594	451	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
29	104	428	5754	464	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
30	107	440	5914	477	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
31	110	452	6074	490	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
32	113	464	6234	503	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
33	116	476	6394	516	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
34	119	488	6554	529	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
35	122	500	6714	542	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
36	125	512	6874	555	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
37	128	524	7034	568	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
38	131	536	7194	581	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
39	134	548	7354	594	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
40	137	560	7514	607	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
41	140	572	7674	620	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
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43	146	596	7994	646	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
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45	152	620	8314	672	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
46	155	632	8474	685	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
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51	170	692	9274	750	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
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56	185	752	10074	815	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
57	188	764	10234	828	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
58	191	776	10394	841	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
59	194	788	10554	854	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
60	197	800	10714	867	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
61	200	812	10874	880	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
62	203	824	11034	893	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
63	206	836	11194	906	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
64	209	848	11354	919	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
65	212	860	11514	932	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
66	215	872	11674	945	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3</						



**TABLE 4—MULTIPASS**  
Temperature range 40° F to 180° F based on using steam at 0 lb. gage

Heater No.	Velocity In Ft. Per Min.	Capacity Gallons Per Hour	Length Overall	Weight	SHELL										HEAD EXPANSION TYPE						HEAD REAR			CRADLES										
					Diam.	Length	Mater.	Steam Inlet	Drift	A	B	C	D	E	F	G	H	Diam.	Water Conns.	Drain	I	J	K	L	M	N	O	P	Q	R				
0	25	25	15 1/2	90	7	11	1	1	3/4	3	4	3	3	3	3	6	1/4	3/4	1 1/2	1 1/2	2 1/4	1	2	3 1/4	3 1/4	3 1/4	9 1/4	1 1/2	—	—	—	—	—	—
1	60	60	26 3/8	125	7	33	1 1/4	1 1/4	3/4	3	4	3	3	3	3 1/2	8	1/4	3/4	1 1/4	1 1/2	2 1/4	1 1/4	2 1/2	3 1/4	3 1/4	3 1/4	9 1/4	1 1/2	—	—	—	—	—	—
2	144	150	37 3/8	280	9 1/2	33	1 1/4	1 1/4	3/4	3	4	3	3	3	3 1/2	10	1/4	3/4	1 1/4	1 1/2	2 1/4	1 1/4	2 1/2	3 1/4	3 1/4	3 1/4	9 1/4	1 1/2	—	—	—	—	—	—
3	200	200	39 3/8	325	9 1/2	33	1 1/4	1 1/4	3/4	4 1/2	5 1/2	3 1/2	4	3 1/2	3 1/2	8	1/4	3/4	1 1/4	1 1/2	2 1/4	1 1/4	2 1/2	3 1/4	3 1/4	3 1/4	9 1/4	1 1/2	—	—	—	—	—	—
4	240	250	48 3/8	325	9 1/2	33	1 1/4	1 1/4	3/4	4 1/2	5 1/2	3 1/2	4	3 1/2	3 1/2	10	1/4	3/4	1 1/4	1 1/2	2 1/4	1 1/4	2 1/2	3 1/4	3 1/4	3 1/4	9 1/4	1 1/2	—	—	—	—	—	—
5	143	300	31 3/4	300	9 1/2	33	1 1/4	1 1/4	3/4	4 1/2	5 1/2	3 1/2	4	3 1/2	3 1/2	8	1/4	3/4	1 1/4	1 1/2	2 1/4	1 1/4	2 1/2	3 1/4	3 1/4	3 1/4	9 1/4	1 1/2	—	—	—	—	—	—
6	191	400	40 3/4	300	9 1/2	33	1 1/4	1 1/4	3/4	4 1/2	5 1/2	3 1/2	4	3 1/2	3 1/2	8	1/4	3/4	1 1/4	1 1/2	2 1/4	1 1/4	2 1/2	3 1/4	3 1/4	3 1/4	9 1/4	1 1/2	—	—	—	—	—	—
7	160	500	43 3/4	325	9 1/2	33	1 1/4	1 1/4	3/4	4 1/2	5 1/2	3 1/2	4	3 1/2	3 1/2	10	1/4	3/4	1 1/4	1 1/2	2 1/4	1 1/4	2 1/2	3 1/4	3 1/4	3 1/4	9 1/4	1 1/2	—	—	—	—	—	—
8	192	600	48 3/4	325	9 1/2	33	1 1/4	1 1/4	3/4	4 1/2	5 1/2	3 1/2	4	3 1/2	3 1/2	10	1/4	3/4	1 1/4	1 1/2	2 1/4	1 1/4	2 1/2	3 1/4	3 1/4	3 1/4	9 1/4	1 1/2	—	—	—	—	—	—
9	139	800	59 1/2	575	12	45	1 1/4	1 1/4	3/4	7 1/2	7 1/2	8 1/2	4	3 1/2	3 1/2	12	1/4	3/4	1 1/4	1 1/2	2 1/4	1 1/4	2 1/2	3 1/4	3 1/4	3 1/4	9 1/4	1 1/2	—	—	—	—	—	—
10	174	1250	64 1/2	645	12	45	1 1/4	1 1/4	3/4	7 1/2	7 1/2	8 1/2	4	3 1/2	3 1/2	12	1/4	3/4	1 1/4	1 1/2	2 1/4	1 1/4	2 1/2	3 1/4	3 1/4	3 1/4	9 1/4	1 1/2	—	—	—	—	—	—
11	217	1500	74	760	15	52	1 1/4	1 1/4	3/4	9 1/2	9 1/2	9	4	3 1/2	3 1/2	16	1/4	3/4	1 1/4	1 1/2	2 1/4	1 1/4	2 1/2	3 1/4	3 1/4	3 1/4	9 1/4	1 1/2	—	—	—	—	—	—
12	156	1500	59 1/2	870	15	65	1 1/4	1 1/4	3/4	10 1/2	10 1/2	11	5	4	4	16	1/4	3/4	1 1/4	1 1/2	2 1/4	1 1/4	2 1/2	3 1/4	3 1/4	3 1/4	9 1/4	1 1/2	—	—	—	—	—	—
13	208	2000	72 3/8	1020	15	65	1 1/4	1 1/4	3/4	12	12	10 1/2	5	4	4	16	1/4	3/4	1 1/4	1 1/2	2 1/4	1 1/4	2 1/2	3 1/4	3 1/4	3 1/4	9 1/4	1 1/2	—	—	—	—	—	—
14	162	2500	59	1035	17	51	1 1/4	1 1/4	3/4	12	12	10 1/2	5	4	4	18	1/4	3/4	1 1/4	1 1/2	2 1/4	1 1/4	2 1/2	3 1/4	3 1/4	3 1/4	9 1/4	1 1/2	—	—	—	—	—	—
15	195	3000	71	1175	17	63	1 1/4	1 1/4	3/4	12	12	10 1/2	5	4	4	18	1/4	3/4	1 1/4	1 1/2	2 1/4	1 1/4	2 1/2	3 1/4	3 1/4	3 1/4	9 1/4	1 1/2	—	—	—	—	—	—
16	260	4000	89	1420	17	81	1 1/4	1 1/4	3/4	14	12	13 1/2	6	4	4	20	1/4	3/4	1 1/4	1 1/2	2 1/4	1 1/4	2 1/2	3 1/4	3 1/4	3 1/4	9 1/4	1 1/2	—	—	—	—	—	—
17	216	5000	74 3/8	1910	20	66	1 1/4	1 1/4	3/4	14	12	13 1/2	7	7 1/2	7 1/2	20	1/4	3/4	1 1/4	1 1/2	2 1/4	1 1/4	2 1/2	3 1/4	3 1/4	3 1/4	9 1/4	1 1/2	—	—	—	—	—	—
18	259	6000	88 3/8	2185	20	66	1 1/4	1 1/4	3/4	14	12	13 1/2	7	7 1/2	7 1/2	20	1/4	3/4	1 1/4	1 1/2	2 1/4	1 1/4	2 1/2	3 1/4	3 1/4	3 1/4	9 1/4	1 1/2	—	—	—	—	—	—
18 1/2	310	7000	101 3/8	2475	26	69	1 1/4	1 1/4	3/4	14	12	13 1/2	8	8 1/2	8 1/2	20	1/4	3/4	1 1/4	1 1/2	2 1/4	1 1/4	2 1/2	3 1/4	3 1/4	3 1/4	9 1/4	1 1/2	—	—	—	—	—	—
19	183	8000	94 3/8	2800	26	69	1 1/4	1 1/4	3/4	14	12	13 1/2	8	8 1/2	8 1/2	20	1/4	3/4	1 1/4	1 1/2	2 1/4	1 1/4	2 1/2	3 1/4	3 1/4	3 1/4	9 1/4	1 1/2	—	—	—	—	—	—
19 1/2	193	9000	102 3/8	3000	26	68	1 1/4	1 1/4	3/4	14	12	13 1/2	8	8 1/2	8 1/2	20	1/4	3/4	1 1/4	1 1/2	2 1/4	1 1/4	2 1/2	3 1/4	3 1/4	3 1/4	9 1/4	1 1/2	—	—	—	—	—	—
20	271	10000	102 3/8	3220	26	68	1 1/4	1 1/4	3/4	14	12	13 1/2	8	8 1/2	8 1/2	20	1/4	3/4	1 1/4	1 1/2	2 1/4	1 1/4	2 1/2	3 1/4	3 1/4	3 1/4	9 1/4	1 1/2	—	—	—	—	—	—
21	327	12500	94 3/8	3725	26	68	1 1/4	1 1/4	3/4	14	12	13 1/2	8	8 1/2	8 1/2	20	1/4	3/4	1 1/4	1 1/2	2 1/4	1 1/4	2 1/2	3 1/4	3 1/4	3 1/4	9 1/4	1 1/2	—	—	—	—	—	—
22	230	20000	113	4125	30	80	1 1/4	1 1/4	3/4	14	12	13 1/2	8	8 1/2	8 1/2	20	1/4	3/4	1 1/4	1 1/2	2 1/4	1 1/4	2 1/2	3 1/4	3 1/4	3 1/4	9 1/4	1 1/2	—	—	—	—	—	—
23	307	20000	113	4680	30	104	1 1/4	1 1/4	3/4	14	12	13 1/2	15	15	15	20	1/4	3/4	1 1/4	1 1/2	2 1/4	1 1/4	2 1/2	3 1/4	3 1/4	3 1/4	9 1/4	1 1/2	—	—	—	—	—	—
24	260	25000	96	6350	36	86	1 1/4	1 1/4	3/4	14	12	13 1/2	15	15	15	20	1/4	3/4	1 1/4	1 1/2	2 1/4	1 1/4	2 1/2	3 1/4	3 1/4	3 1/4	9 1/4	1 1/2	—	—	—	—	—	—
25	312	30000	112	7175	36	102	1 1/4	1 1/4	3/4	14	12	13 1/2	16	16	16	20	1/4	3/4	1 1/4	1 1/2	2 1/4	1 1/4	2 1/2	3 1/4	3 1/4	3 1/4	9 1/4	1 1/2	—	—	—	—	—	—

Sizes 0 to 8 have 3/4" O. D. No. 18 B. W. G. Copper tubes

Larger sizes have 1" O. D. No. 17 B. W. G. Copper tubes.

The above tables show the standard sizes only. For such service as converters (see pages 6 and 7) for which heaters of special proportions are frequently required to meet certain operating conditions, special drawings will be furnished on request.

With steam pressures above atmospheric pressure a smaller heater may be used for the same capacity. Specifications will be gladly furnished on request.

## Specifications for Whitlock Type "R" Instantaneous Heaters

Furnish and install as shown on plans one Whitlock Type "R" Instantaneous Heater as manufactured by The Whitlock Coil Pipe Company, Hartford, Conn.

**Capacity:** The heater shall be capable of heating ( ? ) gallons of water per hour, from ( ? ) to ( ? )°F. when supplied with sufficient steam at ( ? ) pounds gauge pressure. The heater shall operate with water inside of the tubes, the steam being in the shell around the tubes. The heater shall be arranged for operation in a horizontal (or vertical) position as shown on plans. Cast iron cradles (or vertical supporting legs) shall be furnished.

**Construction:** The heater shall be furnished with the necessary steam, condensation, water and

drain connections of sizes as recommended and guaranteed by the heater manufacturer to be suitable for the duty specified. Shell, water chamber and heads shall be of close grain cast iron of the best commercial grade; tube sheet steel; heating section of seamless drawn copper tubing made up into U-bends with ends securely expanded into the steel tube sheet.

**Working Pressure:** The heater shall be suitable for a working pressure of ( ? ) pounds on the shell side and ( ? ) pounds on the tube side.

**Test:** Before shipment, both the shell and tube side of the heater shall be submitted to a hydrostatic test pressure of 50% in excess of the working pressures specified.

## The Significance of the Number of "Passes":

The determination of the number of "passes" in any multitubular type of instantaneous heater is a very important element of design but is simply a means to an end. Having chosen the proper size of heater for any given set of operating conditions the next step is to adjust the relation between the heating surface and the cross sectional area of the liquid passages. The purpose of this adjustment is to obtain the maximum effectiveness from the heating surface by maintaining a high liquid velocity, and at the same time to keep the pressure drop on the liquid side within permissible limits.

These matters of routine design are taken care of by our Engineering and Drafting Departments.



# Sizes of Whitlock Type "R" Convertors for Various Duties

 TABLE 6  
 FORCED CIRCULATION

Gals. Per Min.	Steam at 0 Lbs. Gauge					
	160°-180°	160°-185°	170°-195°	170°-190°	170°-200°	160°-195°
10	3-4	4-4	5-M	5-M	7-M	6-M
20	6-4	7-4	9-4	8-4	10-M	9-M
30	8-4	9-4	10-4	10-4	11-M	11-M
40	10-2	10-4	11-4	11-4	13-M	13-M
50	10-2	11-4	13-M	12-4	14-M	15-M
75	100	12-4	14-M	15-4	16-M	16-M
100	12-2	13-4	16-4	16-4	17-M	17-4
125	14-4	15-4	16-4	17-4	18-4	18-4
150	15-4	16-4	18-4	18-4	19-4	19-4
175	15-2	17-4	18-4	19-4	20-4	20-4
200	17-4	18-4	19-4	20-4	21-4	21-4
250	19-4	19-4	20-4	21-4	22-4	22-4
300	18-4	19-4	21-4	22-4	23-4	23-4
350	18-4	19-4	22-4	23-4	24-4	24-4
400	18-4	19-4	22-4	23-4	25-4	25-4
450	19-2	20-4	23-4	24-4		
500	19-2	21-4	24-4			
550	20-4	21-4				
600	20-4	22-4				
650	21-2	22-4				
700	21-2	23-4				
750	21-2	23-4				
800	21-2	23-4				
900	22-2	23-4				

 TABLE 8  
 FORCED CIRCULATION

Gals. Per Min.	Steam at 10 lbs. Gauge											
	180°	160°	185°	170°	180°	190°	205°	180°	170°	160°	220°	160°-195°
10	2-4	2-4	3-4	3-4	3-4	5-4	5-4	5-4	4-4	4-4	6-M	5-M
20	4-4	5-4	5-4	5-4	6-4	7-4	6-4	6-4	6-4	6-4	6-M	6-4
30	5-2	6-4	7-4	7-4	8-4	9-4	8-4	8-4	8-4	8-4	10-M	8-4
40	6-4	8-4	9-4	9-4	10-4	11-4	10-4	10-4	10-4	10-4	12-M	10-4
50	8-4	9-4	10-2	10-2	11-4	12-4	11-4	11-4	11-4	11-4	13-M	11-4
75	9-2	10-2	11-2	11-2	12-4	13-2	12-4	12-4	12-4	12-4	15-M	13-2
100	10-2	11-2	12-2	12-2	13-2	14-4	13-2	13-2	13-2	13-2	16-4	15-4
125	11-2	12-2	13-2	13-2	14-4	15-4	14-4	14-4	14-4	14-4	17-4	16-4
150	12-2	13-2	14-4	14-4	15-4	16-4	15-4	15-4	15-4	15-4	18-4	17-4
175	13-2	14-4	15-4	15-4	16-4	17-4	16-4	16-4	16-4	16-4	19-4	18-4
200	14-4	15-4	16-4	16-4	17-4	18-4	17-4	17-4	17-4	17-4	20-4	19-4
250	15-2	16-2	17-2	17-2	18-4	19-4	18-4	18-4	18-4	18-4	21-4	20-4
300	16-2	17-2	18-4	18-4	19-4	20-4	19-4	19-4	19-4	19-4	22-2	21-4
350	16-2	17-2	18-4	18-4	19-4	20-4	19-4	19-4	19-4	19-4	23-4	22-4
400	16-2	17-2	18-4	18-4	19-4	20-4	19-4	19-4	19-4	19-4	24-4	23-4
450	17-2	18-4	19-4	19-4	20-4	21-4	20-4	20-4	20-4	20-4	25-4	24-4
500	17-2	18-4	19-4	19-4	20-4	21-4	20-4	20-4	20-4	20-4	26-4	25-4
550	18-2	19-4	20-4	20-4	21-4	22-4	21-4	21-4	21-4	21-4	27-4	26-4
600	18-2	19-4	20-4	20-4	21-4	22-4	21-4	21-4	21-4	21-4	28-4	27-4
650	18-2	19-4	20-4	20-4	21-4	22-4	21-4	21-4	21-4	21-4	29-4	28-4
700	19-2	20-4	21-4	21-4	22-4	23-4	22-4	22-4	22-4	22-4	30-4	29-4
750	19-2	20-4	21-4	21-4	22-4	23-4	22-4	22-4	22-4	22-4	31-4	30-4
800	19-2	20-4	21-4	21-4	22-4	23-4	22-4	22-4	22-4	22-4	32-4	31-4
900	20-2	21-4	22-4	22-4	23-4	24-4	23-4	23-4	23-4	23-4	33-4	32-4
1000	20-2	21-4	22-4	22-4	23-4	24-4	23-4	23-4	23-4	23-4	34-4	33-4
1100	20-2	21-4	22-4	22-4	23-4	24-4	23-4	23-4	23-4	23-4	35-4	34-4
1200	21-2	22-4	23-4	23-4	24-4	25-4	24-4	24-4	24-4	24-4	36-4	35-4
1400	23-2	24-4	25-4	25-4	26-4	27-4	26-4	26-4	26-4	26-4	37-4	36-4

NOTE:—First Figure indicates Size of Heater; Second Figure indicates Number of Passes. S indicates a Special Heater having same diameter as a Standard Two Pass Heater, but of a shorter overall length. Exact specifications on application.

 TABLE 5  
 GRAVITY CIRCULATION

Square Ft. Of Total Radiation	160°-180° 150 B.T.U. Per Sq. Ft. Radiation Per Hr. Steam Pressure						160°-190° 150 B.T.U. Radiation Per Hr. Steam Pressure					
	0#	5#	10#	20#	30#		0#	5#	10#	20#	30#	
1,000	8	6	6-S	6-S	6-S		9	6	5	4	3	
1,500	9	7	6	6-S	6-S		10	8	7	6	6-S	
2,000	11	11-S	11-S	11-S	11-S		11	9	8	7	6	
2,500	12	11-S	11-S	11-S	11-S		12	11-S	11-S	11-S	11-S	
3,000	12	11-S	11-S	11-S	11-S		13	11	11-S	11-S	11-S	
3,500	13	11-S	11-S	11-S	11-S		14	12	11-S	11-S	11-S	
4,000	14	11-S	11-S	11-S	11-S		14	12	11	11-S	11-S	
4,500	15	14-S	14-S	14-S	14-S		16	13	12	11	11-S	
5,000	16	16-S	16-S	16-S	16-S		17	15	14	14-S	14-S	
5,500	18	18-S	18-S	18-S	18-S		18	16	16-S	16-S	16-S	
6,000	18	18-S	18-S	18-S	18-S		19	17	16-S	16-S	16-S	
6,500	18½	18-S	18-S	18-S	18-S		19½	18	18-S	18-S	18-S	
7,000	19½	19½-S	19½-S	19½-S	19½-S		20	18	18-S	18-S	18-S	
7,500	19½	19½-S	19½-S	19½-S	19½-S		21	19½	19½-S	19½-S	19½-S	
8,000	20	19½-S	19½-S	19½-S	19½-S		21	19½	19½-S	19½-S	19½-S	
8,500	20	19½-S	19½-S	19½-S	19½-S		22	21	19½	19½-S	19½-S	
9,000	22	22-S	22-S	22-S	22-S		22	21	19½	19½-S	19½-S	
9,500	22	22-S	22-S	22-S	22-S		23	22	22-S	22-S	22-S	
10,000	22	22-S	22-S	22-S	22-S		24	22	22-S	22-S	22-S	
10,500	24	24-S	24-S	24-S	24-S		24	22	22-S	22-S	22-S	
11,000	24	24-S	24-S	24-S	24-S		24	22	22-S	22-S	22-S	
11,500	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
12,000	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
12,500	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
13,000	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
13,500	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
14,000	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
14,500	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
15,000	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
15,500	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
16,000	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
16,500	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
17,000	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
17,500	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
18,000	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
18,500	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
19,000	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
19,500	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
20,000	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
20,500	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
21,000	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
21,500	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
22,000	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
22,500	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
23,000	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
23,500	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
24,000	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
24,500	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
25,000	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
25,500	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
26,000	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
26,500	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
27,000	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
27,500	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
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29,500	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
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35,500	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
36,000	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
36,500	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
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43,000	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
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48,500	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
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51,500	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
52,000	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
52,500	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
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54,500	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
55,000	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
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58,500	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
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60,500	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
61,000	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
61,500	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
62,000	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
62,500	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
63,000	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
63,500	24	24-S	24-S	24-S	24-S		24	24-S	24-S	24-S	24-S	
64,000	24</											



## Hot Water Heating Systems

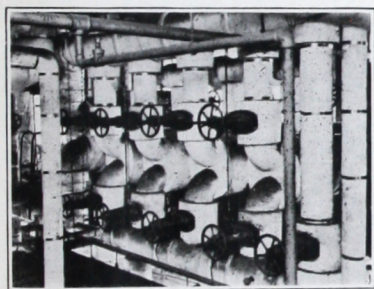
### Convertors

The Whitlock Type "R" Instantaneous heater is widely used in hot water heating systems. As so applied, the heater is usually known as a convertor. Steam is led to the shell of the convertor either from the power plant exhaust or direct from the boilers. Water is passed through the heating section of the convertor and then goes directly to the radiation. Cool water is returned from the radiation to the convertor.

In the "gravity circulation" method, Figure 8, the flow through the system is induced by the difference in specific weight between the ascending column of hot water leading to the radiation and the column of cool water coming away from the radiation.

In the "forced circulation" method, Figure 6 and Figure 7, flow is induced by means of a pump.

The advantages of the gravity method are simplicity, absence of any moving parts and elimination of power cost for promoting the circulation.



Battery of Whitlock Type "R" Convertors installed in a manufacturing plant.

The advantages of the forced method are, on the whole, more pronounced. They include the possibility of using smaller pipe lines to supply a given amount of radiation, a smaller convertor for a given duty, the ability to carry the heating water for long horizontal distances, the ease of exact control, and the possibility of carrying relatively heavy over-loads.

In gravity systems both the pipe lines and convertors must be so proportioned as to keep the water velocity between 50 ft. per minute and 100 ft. per minute as the total head available to effect the circulation is relatively small and the losses due to friction must therefore be kept extremely low.

In the forced system, the water velocity may be raised to 250 to 300 ft. per minute or even higher.

Whitlock Type "R" convertors are frequently used for house heating in communities where steam is supplied from a central plant.

Whitlock Type "R" convertors are regularly built for both gravity and forced circulation, the design and construction being carefully proportioned in each case, to meet the desired operating conditions.

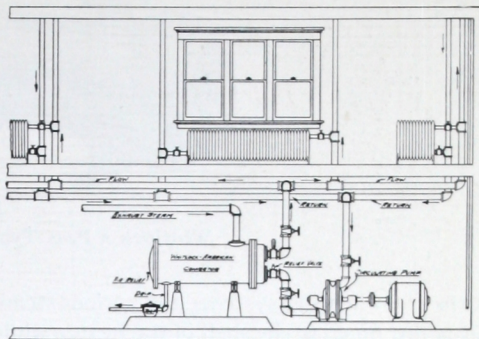


Fig. 6. Typical Installation — Type "R" Convertor — Forced Circulation

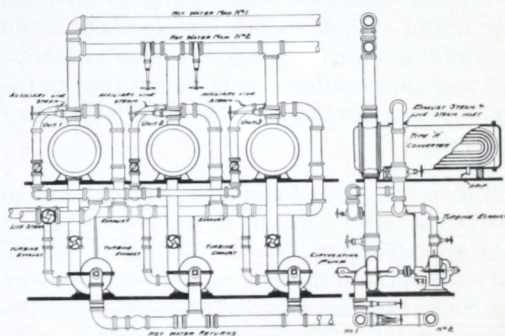


Fig. 7 Typical Piping Plan of 3 Type "R" Convertors Connected in Parallel

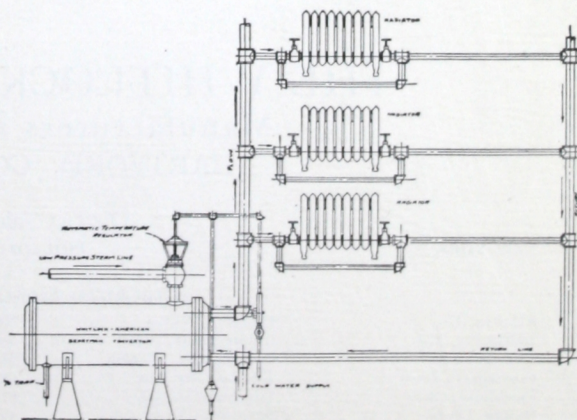


Fig. 8  
Typical Piping Plan — Single Type "R" Convertor — Gravity Circulation



## Condensation Coolers and Preheaters

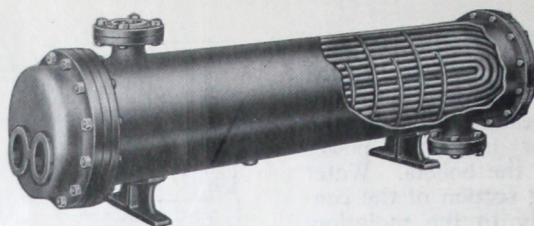


FIG. 9

Whitlock 4 Pass Type R Condensation Cooler

Returns from heating systems and various steam apparatus are piped to the shell of the heater while fresh cold water is led through the heating section. A system of baffles keeps the condensation in close contact with the tubes through which the water is circulating. The condensation is thus cooled and the service water preheated before going to the main service heater. These coolers are especially useful where the steam used is purchased from an outside source and condensation cannot be returned to the boiler. These installations are sometimes called "Economizers."

It is frequently illegal and always inadvisable to discharge hot returns directly to the sewer. Saving this heat is decidedly worthwhile and it will be found economical in the long run to install a cooler with sufficient surface to recover a large proportion of this heat. For further information on these coolers write for our Bulletin No. 100.

TABLE 9  
CAPACITIES OF CONDENSATION COOLERS

Number Of Square Feet Of Radiation	Equivalent Condensation In Pounds Per Hour	Cooling Condensation 200° — 125° While Heating An Equal Amount of Service Water 40° — 115°	Cooling Condensation 200° — 100° While Heating Twice The Amount of Service Water 40° — 90°	Cooling Condensation 200° — 80° While Heating Three Times The Amount of Service Water 40° — 77°
		Type "R" Cooler	Type "R" Cooler	Type "R" Cooler
1000	250	1	2	3
1500	375	2	4	5
2000	500	3	5	6
2500	625	5	6	7
3000	750	5	7	8
3500	875	6	7	8
4000	1000	7	8	9
5000	1250	8	9	10
6000	1500	9	10	11
7000	1750	9	10	11
8000	2000	10	11	12
10000	2500	11	12	13
12500	3125	12	13	14
13000	3750	13	14	15
17500	4275	13	14	15
20000	5000	14	15	16
25000	6250	14	15 ½	17
30000	7500	15	16	18
35000	8750	15 ½	17	18
40000	10000	16	18	18 ½

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